

H. L. LAWRENCE.
ARTIFICIAL LIMB.
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987,893.

Patented Mar. 28, 1911.

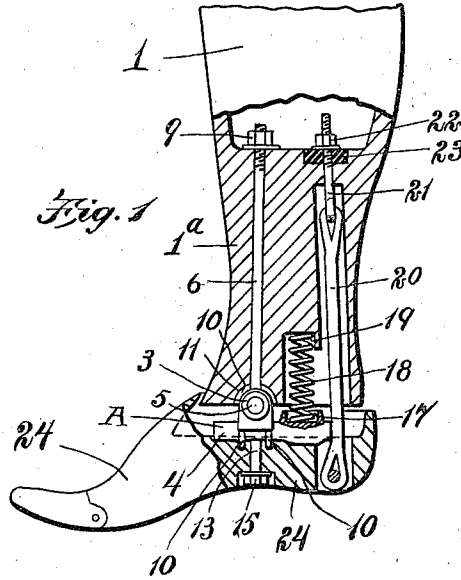


Fig. 2

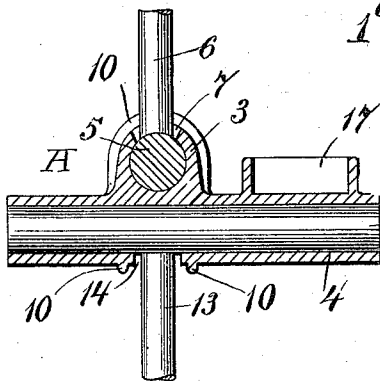


Fig. 3

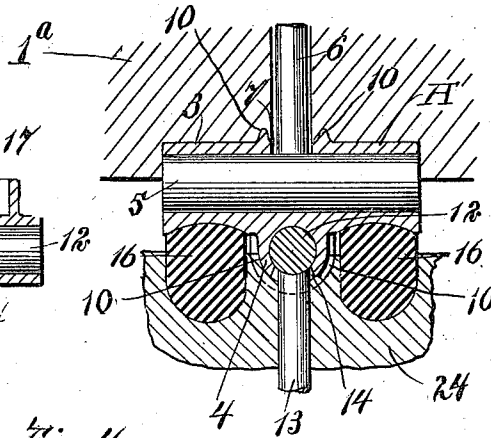
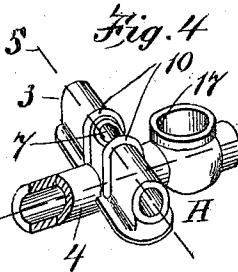


Fig. 4



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HENRY L. LAWRENCE, OF NEW YORK, N. Y.

ARTIFICIAL LIMB.

987,893.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HENRY L. LAWRENCE, a citizen of the United States, and resident of the borough of Brooklyn, city and State of New York, have invented certain new and useful Improvements in Artificial Limbs, of which the following is a specification.

The improvement resides in the connecting devices between the leg 1 and foot 2. These connections include a universal joint of peculiar form especially adapted to be made with great inherent strength to give corresponding strength to the articulation between the foot and leg.

In the drawings which show one of the forms which my improvement may take, Figure 1 is a view partly in vertical mid-section and partly in elevation of an artificial limb within my invention, Fig. 2 is a view partly in elevation and partly in vertical mid-section taken longitudinally through the universal joint member, Fig. 3 is a view partly in elevation and partly in vertical section taken transversely through the universal joint member and showing portions of the leg and foot respectively, also the yielding supports 16; and Fig. 4 is a perspective view with portion broken away of the member included in the universal joint.

Describing now the devices of the drawings and reserving it to the claims to point out the novel features and to define the scope of the invention, A is a member probably best described as being in effect two tubes 3 and 4 secured one over the other at right angles. One of the tubes runs crosswise of the foot and the other lengthwise.

5 is a rock shaft in the upper tube and from it projects at right angles a rod 6 which passes through an opening 7 in the wall of the tube and thence extends uprightly through the lower portion 1^a of the leg 1 beyond which it is screw-threaded and is provided with a nut 9 which secures the leg to the rod.

The mouth of the rod opening 7 is elongated to permit the rod to have all-sufficient angular play relative to the tube so that the leg and foot in turn can have all-sufficient angular play to and away from each other in the plane of Fig. 1.

Circumferential ridges 10 are provided on each side of the rod opening 7 and, being received in corresponding grooves 11 in the bottom of the leg, constitute the bearing be-

tween the bottom of the leg and the transverse tube of the universal joint.

The longitudinal tube of the universal joint has within it a rock shaft 12 with a rod 13 projecting at right angles from it through an opening 14 in the wall of the tube, said rod passing vertically down through the foot 24 at the underside of which it is screw-threaded and provided with a nut 15. Here also the mouth of the rod opening is suitably elongated to permit the rod to rock relative to its tube to an all-sufficient extent in a plane at right angles to Fig. 1, and correspondingly to permit the foot to do the same relative to the leg. Here also the same ridges 10 are provided at the sides of the rod opening to bear in corresponding grooves 11 in the upper side of the foot to serve as the bearing between the foot and the longitudinal tube of the universal joint.

Located between the overhanging ends of the transverse tube and the top of the foot are yielding supports 16 consisting in this case of chunks of rubber serving to give a normal upright position of the leg relative to the foot in the sense of normally maintaining these parts in the plane of Fig. 1, but permitting them, when walking or other occasion requires, to yield or rock on each other in directions at right angles to the plane of Fig. 1.

On the rear end of the longitudinal tube is a socket 17 that faces upward and forms a seat for the lower end of a yielding support 18, in this case a spiral spring the upper end of which is received in a downwardly facing socket 19 in the leg. The effect of this spring is naturally to force the heel end of the foot away from the leg,—in other words, to approach the toe and shin. To oppose this tendency, a member corresponding to the tendon of Achilles is provided consisting of a cord 20 which passes uprightly through the limb and is connected at its lower end with the heel of the foot and at its upper end is attached to the rod 21 that passes through the lower portion 1^a of the leg beyond which it is screw-threaded and provided with a nut 22. A spring or rubber buffer 23 preferably surrounds the rod below the nut. Thus, these devices act to yieldingly oppose the spring 18 and therefore to hold the leg and foot in proper normal equilibrium against rocking motion

in directions corresponding to the plane of Fig. 1. In addition, to provide for all possible relative movements of the foot and leg, and for preventing shock as those movements occur, the improvement has the important advantage that all of the universal joint movements are embodied substantially in one part adapted to be made as a single casting of great strength so that no trouble is experienced in the breaking of parts and the consequent disarticulation of the limb under the great strains to which they are necessarily put in use.

Having thus described my invention, what I claim is:

1. An artificial limb, comprising in combination a leg, a foot and a universal joint connection between them consisting of a pair of integral sockets with their axes at right angles to each other, a member attached to the leg and having its bearing in one of the sockets, and a member attached to the foot having its bearing in the other socket.

2. An artificial limb comprising in combination a leg, a foot, a universal joint connection between them consisting of two tubular members integrally united in crosswise relation one on top of the other, a rock shaft in each tubular member and a rod project-

ing from each rock shaft, one rod being secured to the foot and the other to the leg, yielding supporting means between the top of the foot and the uppermost tubular member, and yielding supporting means between the bottom of the leg and the lowermost tubular member.

3. An artificial limb comprising in combination a leg, a foot, a universal joint connection between them consisting of two tubular members integrally united in crosswise relation one on top of the other, the upper tubular member being transverse to the foot and the lower tubular member being longitudinal, a rock shaft in each, a rod projecting from each rock shaft one rod being secured to the foot and the other to the leg, yielding supports between the overhanging ends of the transverse tubular member and the top of the foot, a yielding support between the upper side of the rear end of the longitudinal tubular member and the bottom of the leg.

Witness my hand this 20th day of July 1909, at New York city.

HENRY L. LAWRENCE.

Witnesses:

E. W. SCHERR, Jr.,

S. S. NEWTON.